Safety and Mission Assurance for the Space Science Enterprise

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OSMA

Foreword

The Office of Safety and Mission Assurance (OSMA) has been assigned the responsibility for achieving the objectives levied by NHB 1101.3 related to oversight, independent assessment, technical review, and evaluation of NASA programs in the areas of safety, integrity, and mission success. To fulfill these objectives, OSMA will provide agency Safety and Mission Assurance (S&MA) policy, oversight, and functional management, and will provide assessments of the S&MA processes that support the Space Science Enterprise. This document establishes an agreement between the Office of Space Science (OSS) and OSMA by defining their respective roles and responsibilities.

This Safety and Mission Assurance agreement presents significant changes in the relationships between the OSMA and OSS, at the Headquarters level. These changes have been formulated in response to the Administrator's guidance of February 1995, in which the Headquarters role in the agency transitions to that of a "corporate" model. Changes in the field Centers safety and mission assurance functional role, which supports OSS programs and projects, are not dictated by this agreement.

OSMA has, however, as outlined in this agreement, modified its relationship with the field Center S&MA organizations. One of these changes is the requirement that each Center [1] S&MA organization will provide an Annual Operating Agreement that details the S&MA services and functions that will be provided to their respective Space Science customers. The Annual Operating Agreements also will include the total resources required to effectively conduct these services and functions

Another change required OSMA to ensure the effective application of Safety, Reliability and Quality Assurance (SR&QA) functions at the field Centers by verifying the robustness of these functions that serve the Enterprise. The verification process will also identify SR&QA areas that can be enhanced for greater effectiveness and efficiency.

1. - For the purposes of this document, JPL is included as a “Center”.

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1.0 Introduction

This document defines the overall approach by which the Office of Safety and Mission Assurance (OSMA) will implement its responsibility for top level independent review, oversight, and evaluation of the Safety and Mission Assurance (S&MA) functions that support the Space Science Enterprise.

OSMA will provide proactive leadership for the Enterprise S&MA activity, including policy, guidance, evaluation and support for the Space Science Enterprise S&MA processes and activities. The overall program assurance activity for the Enterprise will focus on the health, capability, and implementation of an effective safety and mission assurance program which includes safety, reliability, availability, maintainability, quality assurance, and risk management tailored to Enterprise programs and projects. OSMA will obtain insight of the Enterprise at the NASA-wide level, assessing whether the Enterprise is achieving its S&MA objectives. The Center S&MA organizations will provide the program/project level technical insight and independent assessment.

The following will apply in the development of this new approach for the overall Space Science S&MA function:

1. The approach preserves to the greatest extent possible the existing S&MA functions and resources now in place within the Space Science Enterprise.

2. The approach supports the S&MA technical expertise and consultation which is applied by the Center S&MA organizations directly to Enterprise activities.

3. The approach provides added confidence that Center S&MA organizations are working effectively with proper focus, documented procedures, adequate resources, and established performance based metrics.

4. The approach supports the role of the S&MA community in performing independent assessment of programmatic and engineering decisions to assure that proper attention is paid to risk, including special assessments requested by the Space Science Enterprise.

1.1 Principles of Operation

OSMA will provide proactive functional leadership of the Enterprise S&MA activity. To accomplish the leadership role, performance-based standards and metrics will be developed jointly with the Office of Space Science, Centers, and the Center S&MA Directors for each year's operation. This will be documented in each Center's S&MA Annual Operating Agreement (Section 2.3). OSMA will perform Enterprise-unique assessments of the effectiveness of the processes supporting safety and mission assurance within the Space Science field Center(s) responsible for implementing the Space Science programs. Assessments of performance against established standards will be presented formally to the Enterprise.

To perform the S&MA function for the Space Science Enterprise, the following set of necessary conditions has been established:

a) Clear and direct lines of authority required for compliance with basic policy

1. Center S&MA directors have the *absolute authority to stop activities* which are deemed by them to be unsafe. Enterprise program managers must be willing to review their activities when an unassessed risk to safety is identified.

2. Program/project managers *are responsible* for the safety and mission success of their programs/projects. S&MA will assist as partners in the planning, implementation, insight, oversight, and independent assessment thereof.

3. S&MA maintains *independent channels* (from the program) to assess and report on safety and mission assurance issues.

4. OSMA is the *Agency policy maker* in the area of flight safety and institutional safety to ensure compliance with regulatory requirements.

b) Efficient and effective S&MA processes

1. S&MA will be involved with Enterprise management and center programs/projects *early and throughout the life cycle,* including the performance of special assessments requested by the Space Science Enterprise.

2. S&MA processes *will be tailored* to meet the unique needs of Enterprise programs/projects.

3. *Timely, adequate, and appropriate S&MA information* will be available to support decision-makers.

4. *S&MA metrics* will be established and used to evaluate program, project and contractor processes.

5. S&MA assessments will be conducted in conjunction with other related reviews (e.g., Program Management Council activities) to the maximum extent possible.

c) S&MA Integration into "Team NASA"

1. S&MA serves as the "Safety *Conscience of the Agency"* -- to promote safety awareness and critically evaluate the safety of all that NASA and its contractors do, even when others might be reluctant.

2. S&MA serves as *"Team NASA's" consultant* on risk management and risk reduction throughout the program/project life cycle.

3. S&MA serves as *"Team NASA's" corporate memory* to ensure that lessons learned from failures and successes are applied.

4. S&MA *earns respect through vigilance* -- detecting adverse trends and incipient problems with sufficient lead time for effective program/project action.

2.0 Space Science Enterprise Safety and Mission Assurance

The safety and mission assurance program for the Space Science Enterprise will be formulated and implemented on the basis of the following activities:

a) Quality Management
b) Institutional and Flight Operations Safety
c) S&MA Annual Operating Agreements, and
d) Process Verification.

2.1 Quality Management

The OSMA will provide Quality Management policy and guidance to the Headquarters Enterprise Offices and the implementing field Centers. This will include the application of Quality Management and advanced quality methods and techniques to promote maximum efficiency and effectiveness. The major responsibility of this function is to ensure that quality requirements are met throughout all program/project phases, including preliminary and engineering design, research and development, fabrication, ground and flight testing, and operations.

The OSMA Quality Management function includes:

- Developing and assuring implementation of Quality Management policies and processes applicable to the Space Science programs.

- Maintaining insight into the Quality Management activities within the Space Science programs/projects and providing periodic assessments to the Enterprise.

- Promoting and evaluating risk management approaches for Agency programs/projects, facilities, and operations, including risk identification, risk mitigation, and assessment of residual risk.

- Providing leadership in the implementation of advanced quality methods and techniques including ISO 9000, and the promotion of performance-based contracting in concert with the Office of Procurement policy and guidance.

- Promoting and evaluating quality engineering to achieve effective and efficient execution of Enterprise S&MA programs throughout their life cycle. This includes the application of functions such as systems engineering, systems integration, reliability, maintainability, and quality assurance.

Definition and implementation of specific Quality Management activities is the responsibility of the each Center S&MA organization. Each Quality Management program developed by the Center S&MA organization will use a tailored, customer-focused approach to meet the specific needs, constraints, and acceptable risk level of each program/project.

2.2 Institutional and Flight Operations Safety

OSMA is responsible for providing policy and guidance to the Headquarters Enterprise Offices and the implementing field Centers for Institutional and Flight Operations Safety. Each field Center, through its S&MA organization and line organizations, is responsible for assuring safe and reliable operations of its facilities and flight programs. This will be accomplished through field Center implementation of established Agency and government wide policies for facilities safety, aviation safety, hardware and software system safety, and range and operational safety. Center S&MA organizations are responsible for developing effective guidelines and procedures for all applicable safety policies.

2.3 S&MA Annual Operating Agreements

Each field Center S&MA organization will establish an S&MA Annual Operating Agreement which is negotiated with the Enterprise Center S&MA Director, the Center Director, and the OSMA Associate Administrator (AA). These agreements define the scope of the S&MA activities and the resources required to support the Enterprise programs, as well as programs/projects of other NASA Enterprises, and Institutional Safety at each Center, plus any OSMA requirements, and unique OSMA functional initiatives. Resources will include funding from the Center for overall S&MA activities plus funding from projects for project-specific S&MA activities. In addition to the resources required, these agreements will include products, milestones, and performance metrics for S&MA services provided to programs/projects and for Center institutional activities. The agreed upon resources, products, and performance metrics will be used to define and evaluate the effective use of Center S&MA resources.

The Annual Operating Agreement will request the necessary S&MA resources from the Center Director. If required, the AA OSMA will negotiate with the Associate Administrator for the Office of Space Science and/or the Center Director to secure the required support and funding. In those few cases where key requirements can not be adequately met with agreed upon funding, the AA OSMA may consider providing resources to cover the shortfall.

These agreements will provide baselines for Process Verifications conducted by the OSMA to evaluate each implementing S&MA organization, its efficient use of resources, and its effectiveness in meeting customers' needs. Process Verification will also identify areas of the Centers' S&MA processes that require improvement.

2.4 **Process Verification**

The OSMA will establish a verification process to be implemented by the OSMA Payloads and Aeronautics Division with the support of the OSMA Safety and Risk Management Division. This process will independently assess each Center's S&MA organization with regard to:

a) Compliance with OSMA policies and directives
b) Effectiveness of current S&MA activities that support Space Science
c) Availability and quality of resources, and
d) Use of "Mission assurance risk factors" to identify problems or concerns that may require resolution and/or OSMA intervention.

Process Verification will provide an assessment of each Center's S&MA activities. The Center self assessments will provide input to the verification activity. Process Verification will determine needed improvements to the suitability, effectiveness, and efficiency of the Center S&MA processes. These assessments include formal, biennial evaluations and spot-checks of key issues impacting risk assessments, hardware and software system safety, facility and operational safety, flight safety, reliability, and quality assurance.

Metrics and mission assurance risk factors for use in Process Verification will be established by the Space Science S&MA Directors' Working Group (Section 2.5). These metrics will specific to the S&MA processes used at the Centers against which these processes will be evaluated. Mission assurance risk factors, such as high criticality, safety or mission success impact, loss of a national asset or capability, will be used to assess key issues within the Process Verification reviews.

Results of Process Verification at each Center will be provided to the AA OSMA. These results will also be presented to other Enterprise AA's where Center S&MA organizations support Enterprises other than Space Science. It is anticipated that most issues will be resolved by the Center S&MA Director and few will require intervention by the AA OSMA, the Center Director, or the AA for Space Science. Some issues may require more detailed independent assessments and follow up with program/project management.

2.5 Space Science S&MA Directors' Working Group

The Space Science S&MA Directors' Working Group will provide a forum for the open discussion, evaluation, coordination, and formulation of recommendations on common and/or critical SR&QA issues within the Space Science programs. This working group is composed of the Space Science S&MA Directors and the OSMA Director, Payloads and Aeronautics Division. Representative(s) from management, particularly programs and project management, will be asked to participate in the Working Group meetings.

This working group will provide the implementing Center, OSS, and OSMA with timely, objective, non-advocacy assessments of program/project viability, status, and relative safety posture of the Space Science enterprise. It will identify deficiencies and make recommendations for improvement and correction (see Figure 2.5). Such findings and recommendations will be used as input to Process Verification. To do this, the working group will:

a) Assess the SR&QA work processes and overall effectiveness of the entire Space Science S&MA community, including contractor SR&QA processes,

b) Review Space Science programs to ensure that proper attention is being paid to risk and that customer S&MA requirements are being met, including programs/projects in support of other Enterprises,

c) Assess the continuity and effectiveness of safety and mission assurance functions during transitions in management and restructuring activities within the Enterprise; provide assessment results to OSMA, field Center Directors, and AA OSS,

d) Review and assess the ability of Space Science S&MA to achieve and maintain insight, and involvement, in the SR&QA processes applied to program/projects,

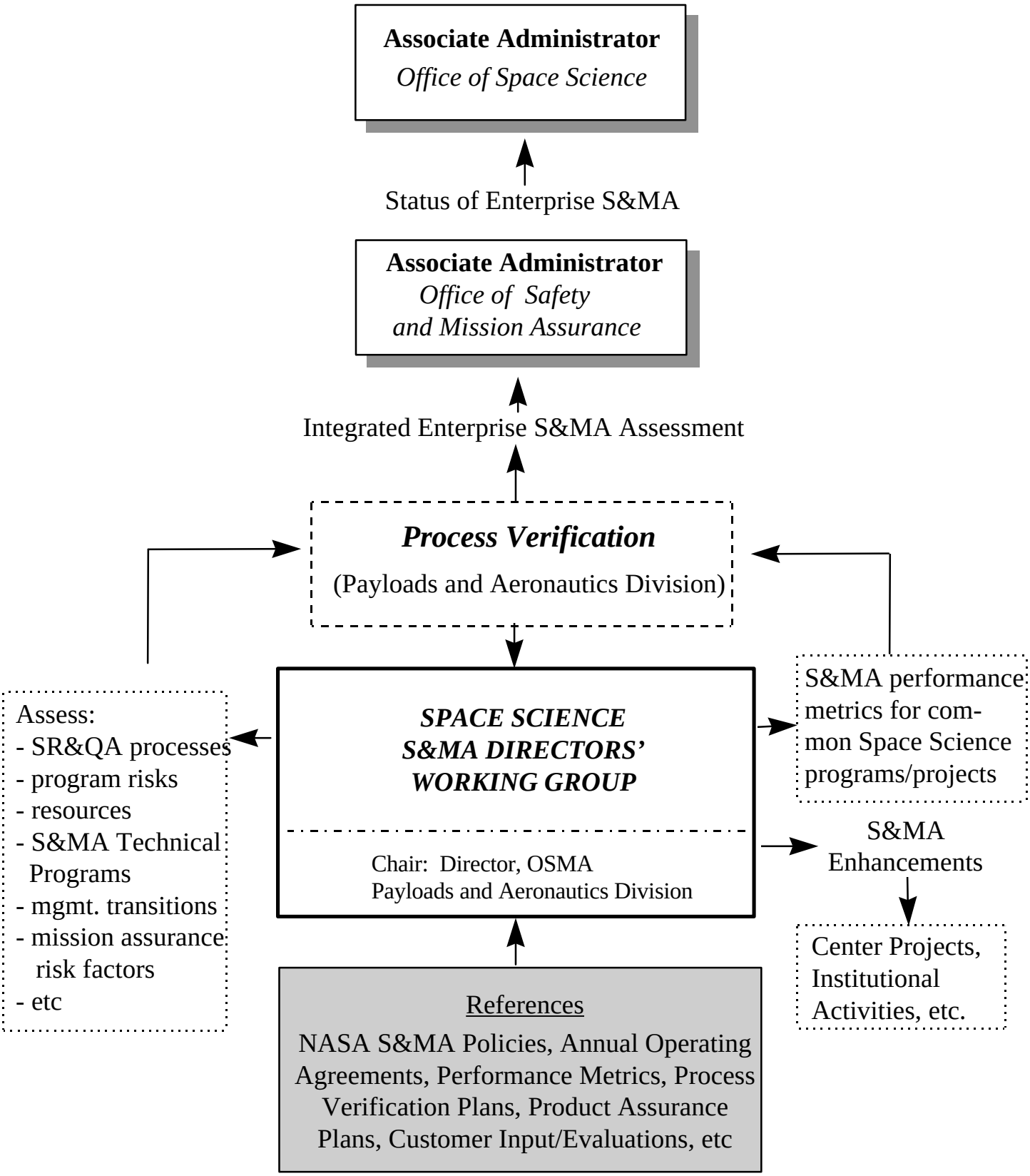
e) Assess the adequacy and effectiveness of S&MA resources which support Space Science program/projects,

f) Identify mission assurance risk factors as guidance for Process Verification, and

g) Develop S&MA performance metrics for those Space Science programs which are implemented at more than one Center.

The Working Group will also provide the leadership to:

- Engender trust and respect among Enterprise S&MA organizations at all levels
- Provide proactive S&MA integration into "Team NASA"
- Enhance and promote clear and open communications



Space Science S&MA Directors' Working Group

Figure 2.5

- Effectively use SR&QA processes and results of Process Verification, and
- Assure compliance with Agency S&MA policy.

2.6 External Participation

Space Science Enterprise programs may be multi-agency in nature, involving NASA, other U.S. agencies, international partners or participants. The Space Science Enterprise S&MA independent assessment function will include consideration of external elements and operations which are part of Space Science programs/projects.

The implementing Center S&MA Directors are responsible for establishing S&MA requirements for those external activities and will generally interface directly with their external counterparts; such activities will be conducted in consultation with the Space Science program managers. S&MA activities will be conducted within the framework of established Space Science Enterprise inter-agency and international agreements, but must also be consistent with established NASA S&MA policies.

External to the Space Science Enterprise, the senior safety and mission assurance managers for external participants interface directly with the AA OSMA regarding agency-to-agency S&MA policies, issues, and/or concerns. Such activities will be conducted in consultation with the Office of Space Science and with the cognizant Center S&MA Directors.

3.0 Safety and Mission Assurance Roles and Responsibilities

3.1 Associate Administrator for Safety and Mission Assurance

a) Develops policy, requirements, standards, and guidance for S&MA for the Enterprise and serves as functional leader for Agency-wide S&MA.

b) Provides to the NASA Administrator, Space Science Associate Administrator, and the implementing Center Directors, overall assessments of the effectiveness and efficiency of the Space Science Enterprise S&MA programs and processes.

c) Provides NASA Administrator, Enterprise AA, and implementing Center Directors with an independent assessment of readiness for ground test and flight test activities.

d) Provides S&MA input to the NASA Program Management Council on Space Science programs.

e) Negotiates with AA OSS and the implementing Center Director(s) to resolve S&MA issues.

f) Provides input to each applicable Center Director and S&MA Director's performance plan and evaluates both their S&MA performance and effectiveness as input to the annual performance rating process.

3.2 Associate Administrator for Space Science

a) Is responsible for safety and mission success for Space Science programs and projects,

b) Ensures that the safety, reliability, and quality of products, operations, services, and facilities are in accordance with applicable policies and requirements

c) Provides sufficient S&MA resources to ensure the effective implementation and performance of S&MA functions.

3.3 Director, Payloads and Aeronautics Division

a) Establishes with each implementing Center S&MA organization an Annual Operating Agreement with products, milestones, metrics, and resources for performance effectiveness. Acts as an advocate to assure resource requirements are met.

b) Performs Process Verification for each implementing field Center S&MA organization.

c) Establishes mission assurance risk factors for Process Verification activities with input from the S&MA Directors' Working Group.

d) Maintains insight into field Center S&MA organizations and their effectiveness and recommends improvements and/or corrective actions as required.

e) Provides to the AA OSMA, an integrated assessment of the effectiveness and efficiency of the implementing Center's S&MA programs and processes. Achievement of annual S&MA performance metrics, the results of Process Verification at each field Center, insight into field Center S&MA activities, and customer satisfaction will be reflected in the assessment.

f) Chairs the Space Science S&MA Directors' Working Group.

g) Provides special assessments of programmatic S&MA issues, including risk management and/or risk mitigation issues, as requested by the Space Science Enterprise.

3.4 **Field Center Directors**

a) Are responsible for safety and mission success for the programs and projects of all NASA Enterprises which are conducted at the Center.

b) Ensure that safety and mission assurance activities are appropriately applied to Center products, operations, services, and facilities in accordance with applicable policies and requirements.

c) Provide an S&MA work force in sufficient numbers and skills to maintain a viable presence in all Center programs, processes, and facilities to ensure the effective implementation and performance of S&MA functions.

d) Provide management and other required support for the Center's S&MA organization, its functions and required activities

e)) Evaluate Center S&MA Director's performance based upon personal knowledge and input received from AA OSMA.

3.5 **Center S&MA Directors**

a) Implement agency S&MA policies at the field Center and support Space Science programs/projects with appropriate levels of safety and mission assurance activities such that project goals and objectives are met efficiently and effectively.

b) Prepare the Annual Operating Agreement for approval by the Center Director and manage the Center's S&MA resources in accordance with the Agreement.

c) Provide appropriate S&MA support to programs/projects at the field Center sponsored by other Enterprises. Activities in support of other Enterprise programs/projects will be consistent with requirements established by the Lead Center S&MA organization.

d) Measure Center S&MA performance against the established metrics and reports results annually to the Center Director and OSMA.

e) Serve as a member of the Space Science S&MA Directors' Working Group.

3.6 Program/Project Managers

a) Are responsible for safety and mission success for assigned programs/projects

b) Ensure that safety and mission assurance activities are appropriately applied during program/project planning and execution in accordance with applicable policies and requirements.

c) Participate as appropriate in Space Science S&MA Directors' Working Group meetings.